

# FACT SHEET FOR NPDES PERMIT WA-002252-7

## VASHON WASTEWATER TREATMENT PLANT



**VASHON SEWER DISTRICT & VICINITY**

### SUMMARY

King County owns and operates a wastewater treatment plant (WWTP) located on Vashon Island. This facility is being expanded from 0.264 MGD to 0.52 MGD, with the new facility expected to be online in the summer of 2006. The expansion involves the construction of a new facility which includes new headworks and odor control, a new oxidation ditch, two new secondary clarifiers, and new RAS/WAS pumps. The existing oxidation ditch will serve as backup, and the existing UV disinfection system will be transferred to the new facility.

The WWTP currently operates under the terms and conditions of the existing NPDES permit number WA-002252-7. This fact sheet is for the proposed permit for the WWTP.

GENERAL INFORMATION	
Applicant	King County Department of Natural Resources & Parks Wastewater Treatment Division 201 - S. Jackson Street Seattle, WA 98104-3855
Facility Name and Address	Vashon Wastewater Treatment Plant c/o King County 9621 - SW 171 Street Vashon, WA 98070
Responsible Official	Pam Bissonette, Director Phone: (206) 296-6500
Type of Treatment	Oxidation Ditch (Secondary Treatment, Extended Aeration)
Discharge Location	Puget Sound, Class AA Marine Waterbody ID No. WA-PS-0240 Latitude: 47° 27' 09" N Longitude: 122° 26' 19" W
Plant Contact	Rick Butler Phone: (206) 684-2400

## TABLE OF CONTENTS

INTRODUCTION .....	1
BACKGROUND INFORMATION .....	1
Description of the Facility .....	1
History.....	1
Collection System Status .....	2
Treatment Processes.....	2
Discharge Outfall .....	2
Residual Solids.....	2
Permit Status .....	2
Summary of Compliance with the Previous Permit.....	3
Wastewater Characterization .....	3
PROPOSED PERMIT LIMITATIONS.....	3
Design Criteria.....	4
Technology-Based Effluent Limitations.....	4
Surface Water Quality-based Effluent Limitations.....	5
Numerical Criteria for the Protection of Aquatic Life.....	6
Numerical Criteria for the Protection of Human Health.....	6
Narrative Criteria .....	6
Antidegradation.....	6
Critical Conditions .....	6
Description of the Receiving Water.....	7
Surface Water Quality Criteria .....	7
Mixing Zones and Dilution Ratios.....	7
Consideration of Surface Water Quality-based Limits for Numeric Criteria .....	9
Whole Effluent Toxicity .....	10
Human Health .....	11
Sediment Quality .....	11
Ground Water Quality Limitations .....	12
Comparison of Effluent Limits with the Existing Permit Issued May 31, 2002.....	12
MONITORING REQUIREMENTS.....	12
Lab Accreditation.....	12
OTHER PERMIT CONDITIONS .....	13
Reporting and Record Keeping.....	13
Prevention of Facility Overloading.....	13
Operation and Maintenance (O&M).....	13
Residual Solids Handling.....	13
Pretreatment .....	14
Duty to Enforce Discharge Prohibitions .....	14
Spill Plan.....	14
Outfall Evaluation.....	15
General Conditions .....	15

PERMIT ISSUANCE PROCEDURES .....	15
Permit Modifications .....	15
Recommendation for Permit Issuance .....	15
REFERENCES FOR TEXT AND APPENDICES.....	16
Appendix A     -     Public Involvement Information	
Appendix B     -     Glossary	
Appendix C     -     Technical Calculations	
Appendix D     -     Response to Comments	
Appendix E     -     Layout Diagram of Treatment Facility	
Appendix F     -     Discharge Monitoring Data, 1999 – 2005	
Appendix G     -     Dilution Zone Model Results	
Appendix H     -     EPA List of 126 Priority Pollutants	

## INTRODUCTION

The Federal Clean Water Act (FCWA, 1972, and later modifications, 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System of permits (NPDES permits), which is administered by the Environmental Protection Agency (EPA). The EPA has authorized the State of Washington to administer the NPDES permit program. Chapter 90.48 RCW defines the Department of Ecology's authority and obligations in administering the wastewater discharge permit program.

The regulations adopted by the state include procedures for issuing permits (chapter 173-220 WAC), technical criteria for discharges from municipal wastewater treatment facilities (chapter 173-221 WAC), water quality criteria for surface and ground waters (chapters 173-201A and 200 WAC), and sediment management standards (chapter 173-204 WAC). These regulations require that a permit be issued before discharge of wastewater to waters of the state is allowed. The regulations also establish the basis for effluent limitations and other requirements which are to be included in the permit. One of the requirements (WAC 173-220-060) for issuing a permit under the NPDES permit program is the preparation of a draft permit and an accompanying fact sheet. Public notice of the availability of the draft permit is required at least thirty days before the permit is issued (WAC 173-220-050). The fact sheet and draft permit are available for review (see *Appendix A--Public Involvement* of the fact sheet for more detail on the public notice procedures).

The fact sheet and draft permit have been reviewed by the Permittee. Errors and omissions identified in this review have been corrected before going to public notice. After the public comment period has closed, the Department will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of the Department's response. The fact sheet will not be revised. Comments and the resultant changes to the permit will be summarized in *Appendix D--Response to Comments*.

## BACKGROUND INFORMATION

### *DESCRIPTION OF THE FACILITY*

#### HISTORY

The Vashon Sewer District was formed on September 22, 1947, with sewer service being first provided in 1955. The first treatment plant consisted of an Imhoff tank, trickling filter, secondary clarifier and discharge to Gorsuch Creek adjacent to the plant. The plant was expanded and upgraded in 1976 to include an oxidation ditch and outfall to marine waters. In November 1999, King County assumed ownership and operation of the Vashon treatment plant from the Vashon Sewer District. King County has modified the headworks to prevent overflows, modified the Imhoff tank for use as a sludge storage tank, and replaced the chlorination system with ultraviolet disinfection. The facility is currently undergoing another expansion that will increase design maximum month flows from 0.264 MGD to 0.52 MGD; the new facility is expected to be online in the summer of 2006.

## COLLECTION SYSTEM STATUS

King County has taken over ownership and operation of the treatment plant, however, Vashon Sewer District still owns and maintains most of the collection system. Infiltration has been an ongoing problem in the collection system since the first collection sewers were installed. Much of the older part of the collection system consists of 3-foot sections of concrete pipe with mortared joints. Various infiltration/inflow studies have been done on the collection system and the Vashon Sewer District has implemented portions of the recommendations in an attempt to reduce extraneous flows. To address health hazard problems, a sewer interceptor line was constructed to serve the Bunker Trail community at the north end of Vashon Island, with waste water from that area transported to the Vashon treatment plant. King County operates and maintains the lift stations in the Bunker Trail community.

## TREATMENT PROCESSES

The new plant is scheduled to be online this summer (2006). When the new facility goes online, the treatment train will include a new headworks and odor control system, a new oxidation ditch (with the existing ditch serving as backup), two new secondary clarifiers (with the existing clarifier serving as backup), and a UV disinfection system (the existing UV system will be transferred to the new facility). Chlorine will be available for disinfection backup in the event the UV system goes out of service. The treated wastewater is discharged into the Puget Sound via a submarine outfall.

## DISCHARGE OUTFALL

King County recently extended their outfall from a depth of -40 feet mean lower-lower water (MLLW) to -200 feet MLLW. The main objective of this extension was to better protect the shellfish beds along the east coast of Vashon Island. The new outfall has been in operation since October 2004 and consists of an eight-inch diameter HDPE pipe and open-ended 8" port. The outfall terminates about 2700 feet from the MLLW beach line.

## RESIDUAL SOLIDS

The Vashon facility removes solids during the treatment of the waste water at the headworks (grit and screenings) and at the secondary clarifier, in addition to incidental solids (rags, scum, and other debris) removed as part of the routine maintenance of the equipment. Grit, rags, scum, and screenings are drained and disposed of as solid waste. Solids removed from the secondary clarifier are transported to King County's South Treatment Plant at Renton where they are processed with the solids from the South Plant. The solids are ultimately disposed, reused, or land applied.

## PERMIT STATUS

The previous permit for this facility was issued on May 31, 2002, and expires on May 31, 2007. A new permit is being proposed well before the expiration date of the previous permit because of the plant expansion. An application for permit renewal was submitted to the Department on February 23, 2006, and accepted by the Department on April 7, 2006. Both the previous and proposed permits place effluent limitations on 5-day Biochemical Oxygen Demand (BOD<sub>5</sub>), Total Suspended Solids (TSS), pH, Fecal Coliform bacteria, and Total Residual Chlorine.

## SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMIT

The facility received its last inspection on August 23, 2005. This was a class II compliance inspection with sampling. Follow-up recommendations from that inspection included modifying the UV system to better facilitate cleaning, better containment of chlorine and alum storage drums, and more frequent cleaning of influent and effluent sample lines. During the history of the previous permit, numerous effluent violations were reported in the Permittee's monthly discharge monitoring reports. Appendix F shows a summary of the reported data for the period January 2000 through March 2006. At the bottom of that spreadsheet, the maximum, minimum and average values are shown, together with permit limitations and design data. Shaded values indicate permit violations or exceedances of design criteria.

Since King County assumed the plant from the Vashon Sewer District in 1999 compliance has improved. However, in recent years the need for expansion has become apparent based on the recent loadings to the plant. BOD loadings have exceeded the 85 percent of maximum month design capacity almost every month since February 2003. Overall the effluent quality has remained within compliance, with the exception of TSS exceedances in January 2005 and January 2006 and fecal coliform exceedances in June 2005 and February 2006. These violations should cease once the new facility is online since it is better designed to handle the current influent loadings. Completion of the new facility is scheduled for summer 2006.

## WASTEWATER CHARACTERIZATION

The concentration of pollutants in the discharge was reported in the NPDES application and in discharge monitoring reports. Appendix F summarizes these data for the past five years with selected parameters shown graphically. These data are summarized in Table 1.

**Table 1. Influent and Effluent Characterization**

Parameter	Influent	Effluent
BOD <sub>5</sub>	345 mg/L	12 mg/L
TSS	241 mg/L	18 mg/L
pH		6.4 – 7.3
Fecal Coliform		61 count / 100 mL

source: DMR data, January 2000 – January 2006

## PROPOSED PERMIT LIMITATIONS

Federal and state regulations require that effluent limitations set forth in an NPDES permit must be either technology- or water quality-based. Technology-based limitations for municipal discharges are set by regulation (40 CFR 133, and chapters 173-220 and 173-221 WAC). Water quality-based limitations are based upon compliance with the Surface Water Quality Standards (chapter 173-201A WAC), Ground Water Standards (chapter 173-200 WAC), Sediment Quality Standards (chapter 173-204 WAC) or the National Toxics Rule (40 CFR 131.36.) The most stringent of these types of limits must be chosen for each of the parameters of concern. Each of these types of limits is described in more detail below.

The limits in this permit are based in part on information received in the application. The effluent constituents in the application were evaluated on a technology- and water quality-basis. The limits necessary to meet the rules and regulations of the State of Washington were determined and included in this permit. Ecology does not develop effluent limits for all pollutants that may be reported on the application as present in the effluent. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation. Effluent limits are not always developed for pollutants that may be in the discharge but not reported as present in the application. In those circumstances the permit does not authorize discharge of the non-reported pollutants. Effluent discharge conditions may change from the conditions reported in the permit application. If significant changes occur in any constituent, as described in 40 CFR 122.42(a), the Permittee is required to notify the Department of Ecology. The Permittee may be in violation of the permit until the permit is modified to reflect additional discharge of pollutants.

### DESIGN CRITERIA

In accordance with WAC 173-220-150 (1)(g), flows or waste loadings shall not exceed approved design criteria. The design criteria for this treatment facility are listed in Table 2 and were taken from *Vashon Island Wastewater Treatment Plant Facilities Plan* prepared by King County Department of Natural Resources and Parks in November 2003 and approved by Ecology on March 8, 2004.

**Table 2. Design Standards for the Vashon Island WWTP**

Parameter	Existing	Post Expansion
Annual average flow		0.18 mgd
Maximum monthly average flow	0.264 mgd	0.52 mgd
Peak hourly flow		1.74 mgd
BOD influent loading	275 lb/day	671 lb/day
TSS influent loading	275 lb/day	671 lb/day

### TECHNOLOGY-BASED EFFLUENT LIMITATIONS

Municipal wastewater treatment plants are a category of discharger for which technology-based effluent limits have been promulgated by federal and state regulations. These effluent limitations are given in the Code of Federal Regulations (CFR) 40 CFR Part 133 (federal) and in chapter 173-221 WAC (state). These regulations are performance standards that constitute all known available and reasonable methods of prevention, control, and treatment for municipal wastewater.

The technology-based limits for pH, fecal coliform, BOD<sub>5</sub>, and TSS, shown in Table 3, are taken from chapter 173-221 WAC.

**Table 3. Technology-based Limits**

Parameter	Limit
pH	Shall be within the range of 6.0 to 9.0 standard units.
Fecal Coliform Bacteria	Monthly Geometric Mean = 200 organisms/100 mL Weekly Geometric Mean = 400 organisms/100 mL
BOD <sub>5</sub> (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L
TSS (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L
Chlorine	Average Monthly Limit = 0.5 mg/L Average Weekly Limit = 0.75 mg/L

The technology-based monthly average limitation for chlorine is derived from standard operating practices. The Water Pollution Control Federation's *Chlorination of Wastewater* (1976) states that a properly designed and maintained wastewater treatment plant can achieve adequate disinfection if a 0.5 mg/liter chlorine residual is maintained after fifteen minutes of contact time. See also Metcalf and Eddy, *Wastewater Engineering, Treatment, Disposal and Reuse*, Third Edition, 1991. A treatment plant that provides adequate chlorination contact time can meet the 0.5 mg/liter chlorine limit on a monthly average basis. According to WAC 173-221-030(11)(b), the corresponding weekly average is 0.75 mg/liter. More stringent chlorine limits were placed in the previous permit, but with the new outfall's larger dilution factors, the chlorine limits have been increased to 0.44 and 0.75 mg/L for average monthly and max daily, respectively.

The following technology-based BOD and TSS mass limits are based on WAC 173-220-130(3)(b) and 173-221-030(11)(b):

Monthly effluent mass loadings (lb/day) were calculated as the maximum monthly design flow (0.52 MGD) x Concentration limit (30 mg/L) x 8.34 (conversion factor) = mass limit 130 lb/day.

The weekly average effluent mass loading is calculated as 1.5 x monthly loading = 195 lb/day.

### *SURFACE WATER QUALITY-BASED EFFLUENT LIMITATIONS*

In order to protect existing water quality and preserve the designated beneficial uses of Washington's surface waters, WAC 173-201A-060 states that waste discharge permits shall be conditioned such that the discharge will meet established surface water quality standards. The Washington State Surface Water Quality Standards (chapter 173-201A WAC) is a state regulation designed to protect the beneficial uses of the surface waters of the state. Water quality-based effluent limitations may be based on an individual waste load allocation (WLA) or on a WLA developed during a basin-wide total maximum daily loading study (TMDL).



## NUMERICAL CRITERIA FOR THE PROTECTION OF AQUATIC LIFE

"Numerical" water quality criteria are numerical values set forth in the State of Washington's Water Quality Standards for Surface Waters (chapter 173-201A WAC). They specify the levels of pollutants allowed in a receiving water while remaining protective of aquatic life. Numerical criteria set forth in the water quality standards are used along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limitations, they must be used in a permit.

## NUMERICAL CRITERIA FOR THE PROTECTION OF HUMAN HEALTH

The state was issued 91 numeric water quality criteria for the protection of human health by the U.S. EPA (EPA 1992). These criteria are designed to protect humans from cancer and other disease and are primarily applicable to fish and shellfish consumption and drinking water from surface waters.

## NARRATIVE CRITERIA

In addition to numerical criteria, "narrative" water quality criteria (WAC 173-201A-030) limit toxic, radioactive, or deleterious material concentrations below those which have the potential to adversely affect characteristic water uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health. Narrative criteria protect the specific beneficial uses of all fresh (WAC 173-201A-130) and marine (WAC 173-201A-140) waters in the state of Washington.

## ANTIDEGRADATION

The State of Washington's Antidegradation Policy requires that discharges into a receiving water shall not further degrade the existing water quality of the water body. In cases where the natural conditions of a receiving water are of lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. Similarly, when receiving waters are of higher quality than the criteria assigned, the existing water quality shall be protected. More information on the State Antidegradation Policy can be obtained by referring to WAC 173-201A-070.

The Department has reviewed existing records and is unable to determine if ambient water quality is either higher or lower than the designated classification criteria given in chapter 173-201A WAC; therefore, the Department will use the designated classification criteria for this water body in the proposed permit. The discharges authorized by this proposed permit should not cause a loss of beneficial uses.

## CRITICAL CONDITIONS

Surface water quality-based limits are derived for the waterbody's critical condition, which represents the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or characteristic waterbody uses.

## DESCRIPTION OF THE RECEIVING WATER

The facility discharges to Puget Sound which is designated as a Class AA receiving water in the vicinity of the outfall. Other nearby point source outfalls include the Miller Creek Wastewater Treatment Plant located about 3.5 miles to the east-southeast, and the Salmon Creek Wastewater Treatment Plant located about 4 miles to the northeast. Characteristic uses include the following:

fish migration; fish and shellfish rearing, spawning and harvesting; wildlife habitat; primary contact recreation; sport fishing; boating and aesthetic enjoyment; commerce and navigation.

Water quality of this class shall markedly and uniformly exceed the requirements for all or substantially all uses.

## SURFACE WATER QUALITY CRITERIA

Applicable criteria are defined in chapter 173-201A WAC for aquatic biota. In addition, U.S. EPA has promulgated human health criteria for toxic pollutants (EPA 1992). Criteria for this discharge are summarized in Table 4.

**Table 4. Class AA Surface Water Criteria – Marine Water**

Parameter	Water Quality Criteria
Fecal Coliform	14 organisms/100 mL maximum geometric mean
Dissolved Oxygen	7.0 mg/L minimum
Temperature	13°C maximum or incremental increases above background
pH	7.0 to 8.5 standard units
Turbidity	Less than 5 NTUs above background
Toxics	No toxics in toxic amounts

## MIXING ZONES AND DILUTION RATIOS

The water quality standards allow the Department of Ecology to authorize mixing zones around a point of discharge in establishing surface water quality-based effluent limits. Both "acute" and "chronic" mixing zones may be authorized for pollutants that can have a toxic effect on the aquatic environment near the point of discharge. The concentration of pollutants at the boundary of these mixing zones may not exceed the numerical criteria for that type of zone. Mixing zones can only be authorized for discharges that are receiving all known, available, and reasonable methods of prevention, control and treatment (AKART) and in accordance with other mixing zone requirements of WAC 173-201A-100. The National Toxics Rule (EPA, 1992) allows the chronic mixing zone to be used to meet human health criteria.

Figure 1 depicts the chronic and acute mixing zones for this outfall. In estuaries, chronic mixing zones shall comply with the most restrictive combination of the following: (i) not extend in any horizontal direction from the discharge port(s) for a distance greater than two hundred feet plus the depth of water over the discharge port(s) as measured during mean lower low water; and (ii) not occupy greater than 25 percent of the width of the water body as measured during mean lower low water (WAC 173-201A-400). An acute mixing zone shall not extend beyond ten percent of the distance as the chronic mixing zone.

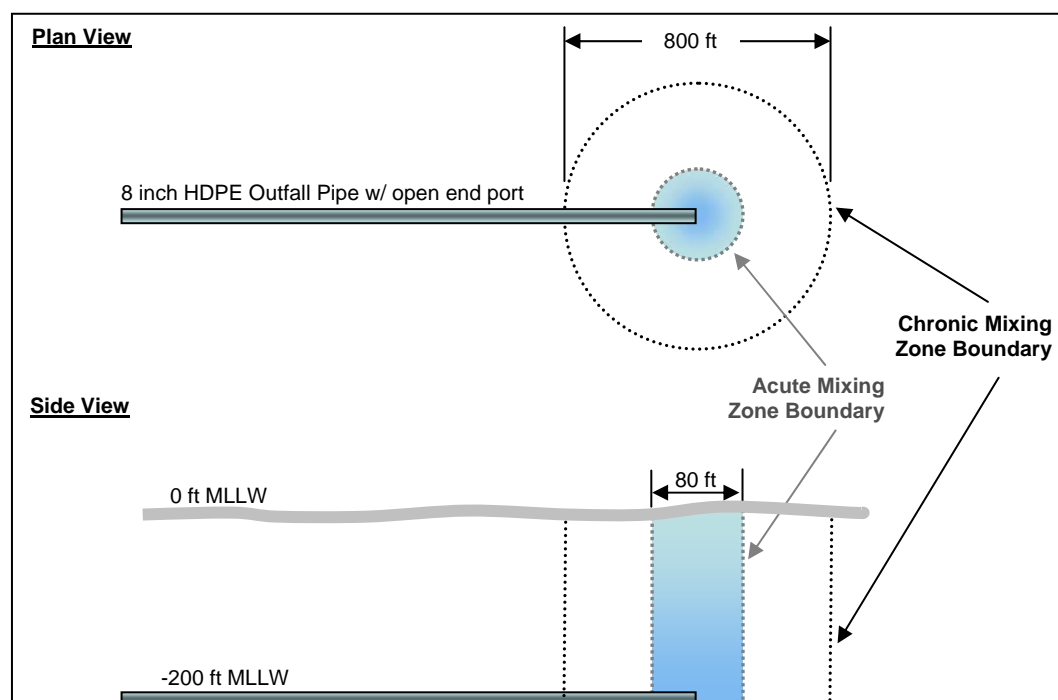


Figure 1. Outfall mixing zone depiction.

### Dilution Modeling

Dilution factors (the ratio of receiving water to effluent) that occur within this zone were determined at the critical condition using dilution models. The outfall was modeled by Cosmopolitan Engineering using the EPA PLUMES model. Modeling procedures and results are summarized in the *Vashon Island Treatment Plant Facilities Plan* (November 2003). Output files are shown in Appendix G. Modeling was conducted at critical combinations of effluent and ambient conditions as specified in the *NPDES Permit Writer's Manual* (Ecology, 2002). The required oceanographic parameters were obtained in field studies conducted by Cosmopolitan in 2000. The acute conditions were evaluated using the peak day flow design criteria; chronic conditions were evaluated using the peak month flow design criteria. The resulting model predicted dilutions are summarized in Table 5.

Table 5. Modeled Outfall Dilution Ratios

Current	Effluent Flow	Port Diameter	Acute Dilution Ratio	Chronic Dilution Ratio
0.084 m/s	0.70 mgd	8"	----	681:1
0.029 m/s	1.37 mgd	8"	89:1	----

## CONSIDERATION OF SURFACE WATER QUALITY-BASED LIMITS FOR NUMERIC CRITERIA

Pollutant concentrations in the proposed discharge exceed water quality criteria with technology-based controls which the Department has determined to be AKART. As discussed earlier, a mixing zone is authorized in accordance with the geometric configuration, flow restriction, and other restrictions for mixing zones in chapter 173-201A WAC.

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Toxic pollutants, for example, are near-field pollutants—their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as BOD is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating water quality-based effluent limits varies with the point at which the pollutant has its maximum effect. The derivation of water quality-based limits also takes into account the variability of the pollutant concentrations in both the effluent and the receiving water.

The impacts of dissolved oxygen deficiency, temperature, pH, fecal coliform, chlorine, ammonia, metals, and other toxics were determined as shown below, using the dilution factors described above.

BOD<sub>5</sub>--Under critical conditions, using simple mixing analysis, there would be less than a 0.1 mg/L dissolved oxygen depression due to the discharge, even with complete exertion of the BOD<sub>5</sub>. Thus, there is no predicted violation of the water quality standards for surface waters. Therefore, the technology-based effluent limitation for BOD<sub>5</sub> was placed in the permit.

Temperature--The impact of the discharge on the temperature of the receiving water was modeled by simple mixing analysis at critical condition. The receiving water temperature at the critical condition is 13°C (at Three Tree Pt) and the effluent temperature is 20°C (from permit application). The predicted resultant temperature at the boundary of the chronic mixing zone is 13°C with a negligible incremental increase. Under critical conditions there is no predicted violation of the water quality standards for surface waters. Therefore, no effluent limitation for temperature was placed in the proposed permit.

pH--Because of the high buffering capacity of marine water, compliance with the technology-based limits of 6.0 to 9.0 will assure compliance with the water quality standards for surface waters.

Fecal Coliform--The numbers of fecal coliform were modeled by simple mixing analysis using the technology-based limit of 400 organisms per 100 ml and the dilution factor of 681. Under critical conditions there is no predicted violation of the water quality standards for surface waters with the technology-based limit. Therefore, the technology-based effluent limitation for fecal coliform bacteria was placed in the proposed permit.

Toxic Pollutants--Federal regulations (40 CFR 122.44) require NPDES permits to contain effluent limits for toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. This process occurs concurrently with the derivation of technology-based effluent limits. Facilities with technology-based effluent limits defined in regulation are not exempted from meeting the water quality standards for surface waters or from having surface water quality-based effluent limits.

The following toxics were determined to be present in the discharge: ammonia, arsenic, copper, lead, nickel, silver, zinc, bis(2-ethylhexyl)phthalate, and potentially chlorine when chlorine is used for disinfection. A reasonable potential analysis (see Appendix C) was conducted on these parameters to determine whether or not effluent limitations would be required in this permit. The determination of the reasonable potential for these toxics to exceed the water quality criteria was evaluated with procedures given in EPA, 1991, at the critical condition. Acute and chronic dilution factors of 89 and 681, respectively, were used in the calculations. Ambient background receiving water ammonia was determined from data taken near Three Tree Point to be 61 µg/L. Ambient background data was unavailable for the other toxics so a concentration of zero was used for the reasonable potential calculations. Water quality criteria for metals in chapter 173-201A WAC are based on the dissolved fraction of the metal.

Calculations using all applicable data resulted in a determination that there is no reasonable potential for this discharge to cause a violation of water quality standards. This determination assumes that the Permittee meets the other effluent limits of this permit.

The Permittee uses UV radiation for disinfection but chlorination equipment is maintained on-site for possible emergency use. For those occasions when chlorine is applied to the effluent, a chlorine effluent limit will be in effect. Effluent limits were derived using methods from EPA, 1991, as shown in Appendix C. The resultant effluent limits were calculated to be 0.44 and 1.16 mg/L for average monthly and maximum daily concentrations, respectively. However, since the technology-based limit for maximum daily chlorine concentration is 0.75 mg/L, the maximum daily limit was capped at 0.75 mg/L. Therefore, the resultant effluent limits for chlorine are as follows:

Residual chlorine, Monthly Average	0.44 mg/L
Residual chlorine, Daily Maximum	0.75 mg/L

It is proposed that these concentrations be included in the permit to be effective only during periods of chlorine application to the effluent.

#### WHOLE EFFLUENT TOXICITY

The water quality standards for surface waters require that the effluent not cause toxic effects in the receiving waters. Many toxic pollutants cannot be detected by commonly available detection methods. However, toxicity can be measured directly by exposing living organisms to the wastewater in laboratory tests and measuring the response of the organisms. Toxicity tests measure the aggregate toxicity of the whole effluent, and therefore this approach is called whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity and other WET tests measure chronic toxicity.

Acute toxicity tests measure mortality as the significant response to the toxicity of the effluent. Dischargers who monitor their wastewater with acute toxicity tests are providing an indication of the potential lethal effect of the effluent to organisms in the receiving environment.

Chronic toxicity tests measure various sublethal toxic responses such as retarded growth or reduced reproduction. Chronic toxicity tests often involve either a complete life cycle test of an organism with an extremely short life cycle or a partial life cycle test on a critical stage of one of a test organism's life cycles. Organism survival is also measured in some chronic toxicity tests.

Accredited WET testing laboratories have the proper WET testing protocols, data requirements, and reporting format. Accredited laboratories are knowledgeable about WET testing and capable of calculating an NOEC, LC<sub>50</sub>, EC<sub>50</sub>, IC<sub>25</sub>, etc. All accredited labs have been provided the most recent version of the Department of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*, which is referenced in the permit. Any Permittee interested in receiving a copy of this publication may call the Ecology Publications Distribution Center at 360-407-7472 for a copy. Ecology recommends that Permittees send a copy of the acute or chronic toxicity sections(s) of their permits to their laboratory of choice.

The WET tests during effluent characterization indicate that no reasonable potential exists to cause receiving water acute or chronic toxicity. Therefore, the Permittee will not be given acute or chronic WET limits and will only be required to retest the effluent prior to application for permit renewal in order to demonstrate that acute or chronic toxicity has not increased in the effluent. The Vashon WWTP is required to perform four WET tests for the next permit application because King County is a delegated pretreatment entity.

If the Permittee makes process or material changes which, in the Department's opinion, results in an increased potential for effluent toxicity, then the Department may require additional effluent characterization in a regulatory order, by permit modification, or in the permit renewal. Toxicity is assumed to have increased if WET testing conducted for submission with a permit application fails to meet the performance standards in WAC 173-205-020, "whole effluent toxicity performance standard." The Permittee may demonstrate to the Department that changes have not increased effluent toxicity by performing additional WET testing after the time the process or material changes have been made.

## HUMAN HEALTH

Washington's water quality standards now include 91 numeric health-based criteria that must be considered in NPDES permits. These criteria were promulgated for the state by the U.S. EPA in its National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992).

The Department has determined that the effluent is likely to have chemicals of concern for human health. The discharger's status is based on data indicating regulated chemicals occur in the discharge. A determination of the discharge's potential to cause an exceedance of the water quality standards was conducted as required by 40 CFR 122.44(d). The reasonable potential determination was evaluated with procedures given in the *Technical Support Document for Water Quality-based Toxics Control* (EPA/505/2-90-001) and the Department's *Permit Writer's Manual* (Ecology Publication 92-109, July 1994). The determination indicated that the discharge has no reasonable potential to cause a violation of water quality standards, thus an effluent limit is not warranted.

## SEDIMENT QUALITY

The Department has promulgated aquatic sediment standards (chapter 173-204 WAC) to protect aquatic biota and human health. These standards state that the Department may require Permittees to evaluate the potential for the discharge to cause a violation of applicable standards (WAC 173-204-400). The Department has determined through a review of the discharger

characteristics, a recent sediment study (October 2003), and effluent characteristics that this discharge has no reasonable potential to violate the sediment management standards.

### *GROUND WATER QUALITY LIMITATIONS*

The Department has promulgated ground water quality standards (chapter 173-200 WAC) to protect uses of ground water. Permits issued by the Department shall be conditioned in such a manner so as not to allow violations of those standards (WAC 173-200-100). This Permittee has no discharge to ground and therefore no limitations are required based on potential effects to ground water.

### *COMPARISON OF EFFLUENT LIMITS WITH THE EXISTING PERMIT ISSUED 5/31/2002*

The proposed effluent concentration limits are the same as those in the previous permit. Mass limits have increased by approximately a factor of two due to the larger design flows of the new facility.

## **MONITORING REQUIREMENTS**

Monitoring, recording, and reporting are required (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and the effluent limitations are being achieved.

Monitoring of sludge quantity and quality is necessary to determine the appropriate uses of the sludge. Sludge monitoring is required by the current state and local solid waste management program and also by EPA under 40 CFR 503. Sludge monitoring for this facility is done at the King County South Plant at Renton.

The monitoring schedule is detailed in the proposed permit under Condition S.2. Specified monitoring frequencies take into account the quantity and variability of discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is consistent with agency guidance given in the current version of Ecology's *Permit Writer's Manual* (July 2002) for activated sludge WWTPs less than 2.0 MGD.

Additional monitoring is required in order to further characterize the effluent. These monitored pollutants could have a significant impact on the quality of the surface water. Priority pollutant metals shall be tested to determine if there is a reasonable potential to exceed water quality criteria. Additional monitoring is also required to prepare the Permittee to meet the requirements of the next permit application.

### *LAB ACCREDITATION*

With the exception of certain parameters the permit requires all monitoring data to be prepared by a laboratory registered or accredited under the provisions of chapter 173-50 WAC, *Accreditation of Environmental Laboratories*. The laboratory at this facility (accreditation #M1097, <http://www.ecy.wa.gov/apps/eap/acclabs/lab.asp?id=1097>) is accredited for

Biochemical Oxygen Demand (BOD<sub>5</sub>/CBOD<sub>5</sub>), pH, Total Residual Chlorine, Total Suspended Solids, and Fecal Coliform count.

## **OTHER PERMIT CONDITIONS**

### ***REPORTING AND RECORD KEEPING***

The conditions of S3 are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 173-220-210).

### ***PREVENTION OF FACILITY OVERLOADING***

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require the Permittee to take the actions detailed in proposed permit requirement S.4 to plan expansions or modifications before existing capacity is reached and to report and correct conditions that could result in new or increased discharges of pollutants. Condition S.4 restricts the amount of flow.

### ***OPERATION AND MAINTENANCE (O&M)***

The proposed permit contains Condition S.5 as authorized under RCW 90.48.110, WAC 173-220-150, chapter 173-230 WAC, and WAC 173-240-080. It is included to ensure proper operation and regular maintenance of equipment, and to ensure that adequate safeguards are taken so that constructed facilities are used to their optimum potential in terms of pollutant capture and treatment. The proposed permit requires submission of an updated O&M Manual for the treatment facility.

### ***RESIDUAL SOLIDS HANDLING***

To prevent water quality problems the Permittee is required in permit Condition S7 to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with the requirements of RCW 90.48.080 and state water quality standards.

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503, and by Ecology under chapter 70.95J RCW, chapter 173-308 WAC "Biosolids Management," and chapter 173-350 WAC "Solid Waste Handling Standards." The disposal of other solid waste is under the jurisdiction of the King County Health Department.

All sewage sludge produced at the Vashon wastewater treatment plant is hauled to King County's South Treatment Plant at Renton for further treatment and disposal or reuse. As the quality of biosolids/sewage sludge is carefully monitored at South Plant, there is no need for duplicative monitoring at Vashon.



### *PRETREATMENT*

To provide more direct and effective control of pollutants discharged, King County has been delegated permitting, monitoring, and enforcement authority for industrial users discharging to their treatment system. The Department oversees the delegated Industrial Pretreatment Program to assure compliance with federal pretreatment regulations (40 CFR Part 403) and categorical standards and state regulations (chapter 90.48 RCW and chapter 173-216 WAC).

At the writing of this permit and fact sheet, the only industrial user discharging to the Vashon Island WWTP is a tofu manufacturer.

The Department may modify this permit to incorporate additional requirements relating to the establishment and enforcement of local limits for pollutants of concern. Any permit modification is subject to formal due process procedures pursuant to state and federal law and regulation.

### *DUTY TO ENFORCE DISCHARGE PROHIBITIONS*

This provision prohibits the POTW from authorizing or permitting an industrial discharger to discharge certain types of waste into the sanitary sewer. The first portion of the provision prohibits acceptance of pollutants which cause pass-through or interference. The definitions of pass-through and interference are in Appendix B of the fact sheet.

The second portion of this provision prohibits the POTW from accepting certain specific types of wastes, namely those which are explosive, flammable, excessively acidic, basic, otherwise corrosive, or obstructive to the system. In addition, wastes with excessive BOD, petroleum-based oils, or which result in toxic gases are prohibited to be discharged. The regulatory basis for these prohibitions is 40 CFR Part 403, with the exception of the pH provisions which are based on WAC 173-216-060.

The third portion of this provision prohibits certain types of discharges such as cooling water in significant volumes, storm water, and other direct inflow sources other than contaminated industrial stormwater, and waste waters significantly affecting system hydraulic loading, which do not require treatment. These discharges shall be prohibited unless specifically permitted in the POTW's pretreatment program by ordinance, rule, or policy approved by the Department.

Due to the small capacity of the Vashon treatment plant, and the dependency of any local limitation calculation on the size of any proposed industrial discharge, limitations should be evaluated on a case-by-case basis upon receiving applications for industrial discharges.

### *SPILL PLAN*

The Department has determined that the Permittee stores a quantity of wastes and/or chemicals that have the potential to cause water pollution if accidentally released. The Department has the authority to require the Permittee to develop best management plans to prevent this accidental release under Section 402(a)(1) of the Federal Water Pollution Control Act (FWPCA) and RCW 90.48.080. The proposed permit requires the Permittee to develop and implement a plan for preventing the accidental release of pollutants to state waters and for minimizing damages if such a spill occurs.

### *OUTFALL EVALUATION*

The proposed permit does not require the Permittee to conduct an outfall inspection. The purpose of an inspection would be to determine the condition of the discharge pipe and to determine if sediment is accumulating in the vicinity of the outfall. Since the outfall was installed in October of 2004, it is being assumed the integrity of the outfall is still intact. However, an outfall inspection will likely be required during the next permit cycle.

### *GENERAL CONDITIONS*

General Conditions are based directly on state and federal law and regulations and have been standardized for all individual municipal NPDES permits issued by the Department.

## **PERMIT ISSUANCE PROCEDURES**

### *PERMIT MODIFICATIONS*

The Department may modify this permit to impose numerical limitations, if necessary, to meet water quality standards, sediment quality standards, or ground water standards, based on new information obtained from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies. The Department may also modify this permit as a result of new or amended state or federal regulations.

### *RECOMMENDATION FOR PERMIT ISSUANCE*

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to protect human health, aquatic life, and the beneficial uses of waters of the state of Washington. The Department proposes that this permit be issued for five years.

## REFERENCES FOR TEXT AND APPENDICES

### Environmental Protection Agency (EPA)

1992. *National Toxics Rule*. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.
1991. *Technical Support Document for Water Quality-based Toxics Control*. EPA/505/2-90-001.
1988. *Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling*. USEPA Office of Water, Washington, D.C.
1985. *Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water*. EPA/600/6-85/002a.
1983. *Water Quality Standards Handbook*. USEPA Office of Water, Washington, D.C.

### King County

2003. *Vashon Island Wastewater Treatment Plant Facilities Plan* prepared by King County Department of Natural Resources and Parks in November 2003 and approved by Ecology March 8, 2004.

### Metcalf and Eddy.

1991. *Wastewater Engineering, Treatment, Disposal, and Reuse*. 3<sup>rd</sup> Edition. Tsivoglou, E.C., and J.R. Wallace.
1972. *Characterization of Stream Reaeration Capacity*. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

### Washington State Department of Ecology.

Laws and Regulations: <http://www.ecy.wa.gov/laws-rules/index.html>

Permit and Wastewater Related Information:

<http://www.ecy.wa.gov/programs/wq/wastewater/index.html>

2002. *Permit Writer's Manual*. Publication Number 92-109

### Water Pollution Control Federation.

1976. *Chlorination of Wastewater*. Wright, R.M., and A.J. McDonnell.
1979. *In-stream Deoxygenation Rate Prediction*. Journal Environmental Engineering Division, ASCE. 105(E2). (Cited in EPA 1985 op.cit.)

## **APPENDIX A--PUBLIC INVOLVEMENT INFORMATION**

The Department has tentatively determined to reissue a permit to the applicant listed on page one of this fact sheet. The permit contains conditions and effluent limitations which are described in the rest of this fact sheet.

Public Notice of Application (PNOA) was published on April 10 and 17, 2006, in the *Seattle Times* to inform the public that an application had been submitted and to invite comment on the reissuance of this permit.

The Department published a Public Notice of Draft (PNOD) on July 11, 2006, in the *Seattle Times* to inform the public that a draft permit and fact sheet were available for review. Interested persons were invited to submit written comments regarding the draft permit. The draft permit, fact sheet, and related documents were available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at the regional office listed below. Written comments were mailed to:

Water Quality Permit Coordinator  
Department of Ecology  
Northwest Regional Office  
3190 – 160<sup>th</sup> Avenue SE  
Bellevue, WA 98008-5452

Any interested party may comment on the draft permit or request a public hearing on this draft permit within the thirty (30)-day comment period to the address above. The request for a hearing shall indicate the interest of the party and the reasons why the hearing is warranted. The Department will hold a hearing if it determines there is a significant public interest in the draft permit (WAC 173-220-090). Public notice regarding any hearing will be circulated at least thirty (30) days in advance of the hearing. People expressing an interest in this permit will be mailed an individual notice of hearing (WAC 173-220-100).

Comments should reference specific text followed by proposed modification or concern when possible. Comments may address technical issues, accuracy and completeness of information, the scope of the facility's proposed coverage, adequacy of environmental protection, permit conditions, or any other concern that would result from issuance of this permit.

The Department will consider all comments received within thirty (30) days from the date of public notice of draft indicated above, in formulating a final determination to issue, revise, or deny the permit. The Department's response to all significant comments is available upon request and will be mailed directly to people expressing an interest in this permit.

Further information may be obtained from the Department by telephone, 425-649-7201, or by writing to the address listed above.

## APPENDIX B--GLOSSARY

**Acute Toxicity**--The lethal effect of a pollutant on an organism that occurs within a short period of time, usually 48 to 96 hours.

**AKART**--An acronym for "all known, available, and reasonable methods of prevention, control, and treatment."

**Ambient Water Quality**--The existing environmental condition of the water in a receiving water body.

**Ammonia**--Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

**Average Monthly Discharge Limitation** --The highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month (except in the case of fecal coliform). The daily discharge is calculated as the average measurement of the pollutant over the day.

**Average Weekly Discharge Limitation**--The highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week. The daily discharge is calculated as the average measurement of the pollutant over the day.

**Best Management Practices (BMPs)**--Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

**BOD<sub>5</sub>**--Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD<sub>5</sub> is used in modeling to measure the reduction of dissolved oxygen in a receiving water after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

**Bypass**--The intentional diversion of waste streams from any portion of a treatment facility.

**CBOD<sub>5</sub>**--The quantity of oxygen utilized by a mixed population of microorganisms acting on the nutrients in the sample in an aerobic oxidation for five days at a controlled temperature of 20 degrees Celsius, with an inhibitory agent added to prevent the oxidation of nitrogen compounds. The method for determining CBOD<sub>5</sub> is given in 40 CFR Part 136.

**Chlorine**--Chlorine is used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

**Chronic Toxicity**--The effect of a pollutant on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

**Clean Water Act (CWA)**--The Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

**Combined Sewer Overflow (CSO)**--The event during which excess combined sewage flow caused by inflow is discharged from a combined sewer, rather than conveyed to the sewage treatment plant because either the capacity of the treatment plant or the combined sewer is exceeded.

**Compliance Inspection - Without Sampling**--A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

**Compliance Inspection - With Sampling**--A site visit to accomplish the purpose of a Compliance Inspection - Without Sampling and as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the percent removal requirement. Additional sampling may be conducted.

**Composite Sample**--A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing a minimum of four discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

**Construction Activity**--Clearing, grading, excavation, and any other activity which disturbs the surface of the land. Such activities may include road building; construction of residential houses, office buildings, or industrial buildings; and demolition activity.

**Continuous Monitoring**--Uninterrupted, unless otherwise noted in the permit.

**Critical Condition**--The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

**Dilution Factor**--A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the effluent fraction, for example, a dilution factor of 10 means the effluent comprises 10 percent by volume and the receiving water 90 percent.

**Engineering Report**--A document which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130.

**Fecal Coliform Bacteria**--Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

**Grab Sample**--A single sample or measurement taken at a specific time or over as short period of time as is feasible.

**Industrial User**--A discharger of wastewater to the sanitary sewer which is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

**Industrial Wastewater**--Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business; from the development of any natural resource; or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

**Infiltration and Inflow (I/I)**--"Infiltration" means the addition of ground water into a sewer through joints, the sewer pipe material, cracks, and other defects. "Inflow" means the addition of precipitation-caused drainage from roof drains, yard drains, basement drains, street catch basins, etc., into a sewer.

**Interference**--A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and

Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent state or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including state regulations contained in any state sludge management plan prepared pursuant to Subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

**Major Facility**--A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

**Maximum Daily Discharge Limitation**--The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

**Method Detection Level (MDL)**--The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is above zero and is determined from analysis of a sample in a given matrix containing the analyte.

**Minor Facility**--A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

**Mixing Zone**--A volume that surrounds an effluent discharge within which water quality criteria may be exceeded. The area of the authorized mixing zone is specified in a facility's permit and follows procedures outlined in Washington State regulations (chapter 173-201A WAC).

**National Pollutant Discharge Elimination System (NPDES)**--The NPDES (Section 402 of the Clean Water Act) is the federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the state of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both state and federal laws.

**Pass-through**--A discharge which exits the POTW into waters of the state in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of state water quality standards.

**pH**--The pH of a liquid measures its acidity or alkalinity. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

**Potential Significant Industrial User**--A potential significant industrial user is defined as an Industrial User which does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

- a. Exceeds 0.5 percent of treatment plant design capacity criteria and discharges <25,000 gallons per day; or
- b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (for example, facilities which develop photographic film or paper, and car washes).

The Department may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

**Quantitation Level (QL)**--A calculated value five times the MDL (method detection level).

**Significant Industrial User (SIU)**--

- 1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N; and
- 2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority\* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).



Upon finding that the industrial user meeting the criteria in paragraph two, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority\* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

\*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

**State Waters**--Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, wetlands, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

**Stormwater**--That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

**Technology-based Effluent Limit**--A permit limit that is based on the ability of a treatment method to reduce the pollutant.

**Total Suspended Solids (TSS)**--Total suspended solids are the particulate materials in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

**Upset**--An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

**Water Quality-based Effluent Limit**--A limit on the concentration or mass of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into a receiving water.

## APPENDIX C--TECHNICAL CALCULATIONS

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found on the Department's homepage at (<http://www.ecy.wa.gov/programs/wq/wastewater/index.html>)

### Vashon WWTP Receiving Water Calculations

Chronic Dilution Factor	681
Acute Dilution Factor	89

#### Temperature Calculation

Receiving Water Temperature	12.95	°C	
Facility Design Max Month Flow	0.52	mgd	
	0.80	cfs	
Effluent Max Temp - estimate	20.00	°C	
<b>Downstream Temp</b>	<b>12.96</b>	<b>°C</b>	
Downstream Incremental Change	0.01	°C	
Class AA Surface Water Criteria	13	°C	Current state WAC designation

**Conclusion:** At design flow, discharge has negligible impact on receiving water temperature.

#### BOD Calculation

Receiving Water DO	8.00	mg/L	
Effluent BOD - worst case	45	mg/L	
<b>Downstream DO</b>	<b>7.92</b>	<b>mg/L</b>	
Downstream DO Degradation	0.08	mg/L	
Class AA Surface Water Criteria	>7.0	mg/L	Current state WAC designation

**Conclusion:** At design flow, discharge has negligible impact on receiving water DO

#### Fecal Coliform Calculation

Effluent Fecal Coliform - worst case	400	#/100 ml	
<b>Downstream Fecal Coliform</b>	<b>0.6</b>	<b>#/100 ml</b>	
Class AA Surface Water Criteria	14.0	#/100 ml	Current state WAC designation

**Conclusion:** At design flow, discharge has small impact on receiving water fecal coliform conc.

## APPENDIX C--TECHNICAL CALCULATIONS (CONT'D)

### Priority Pollutants Detected in Vashon WWTP Effluent

Parameter	Units	MDL	RDL	Sample Date			Human Health Criteria	Aquatic Life Criteria
				4/19/05	8/4/05	2/7/06		
Arsenic, Total, ICP-MS	ug/L	0.50	2.50	5.91	3.60	4.18	none	chronic: 36 acute: 69
Barium, Total, ICP-MS	ug/L	0.20	1.00	4.26	4.04	11.60	none	none
Chromium, Total, ICP-MS	ug/L	0.40	2.00		0.77	0.58	none	none
Cobalt, Total, ICP-MS	ug/L	0.20	1.00			0.35	none	none
Copper, Total, ICP-MS	ug/L	0.40	2.00	7.21	12.80	6.10	none	chronic: 3.1 acute: 4.8
Lead, Total, ICP-MS	ug/L	0.20	1.00		0.49	0.29	none	chronic: 8.1 acute: 210
Molybdenum, Total, ICP-MS	ug/L	0.50	2.50	0.82		0.91	none	none
Nickel, Total, ICP-MS	ug/L	0.30	1.50	2.25	2.56	2.70	4,600	chronic: 8.2 acute: 74
Silver, Total, ICP-MS	ug/L	0.20	1.00	0.30	1.46	0.67	none	chronic: n/a acute: 1.9
Vanadium, Total, ICP-MS	ug/L	0.30	1.50	0.80		0.77	none	none
Zinc, Total, ICP-MS	ug/L	0.50	2.50	36.50	91.40	27.70	none	chronic: 81 acute: 90
Acetone	ug/L	2.50	10.00		4.20		none	none
Bis(2-Ethylhexyl)Phthalate	ug/L	0.19	0.95	1.11	1.02	1.51	5.9	none
Caffeine	ug/L	0.19	0.95	0.26		0.31	none	none
Oil And Grease, Total	mg/L	2.00	5.00		2.40	19.70	none	none
Hardness, Calc	mg CaCO3/L	0.20	1.25	80.1	112.0	67.1	none	none

## APPENDIX C--TECHNICAL CALCULATIONS (CONT'D)

### Ammonia Calculation Spreadsheet

Calculation of seawater fraction of un-ionized ammonia  
from Hampson (1977). Un-ionized ammonia criteria for  
salt water are from EPA 440/5-88-004. Revised 19-Oct-93.

Facility: Vashon WWTP  
Permit No: WA-002252-7  
Run Date: 3/23/06

INPUT - Receiving Water Parameters	
1. Temperature (deg C):	15.8
2. pH:	9.2
3. Salinity (g/Kg):	25.4
OUTPUT	
1. Pressure (atm; EPA criteria assumes 1 atm):	1.0
2. Molal Ionic Strength (not valid if >0.85):	0.520
3. pKa8 at 25 deg C (Whitfield model "B"):	9.305
4. Percent of Total Ammonia Present as Unionized:	28.310%
5. Unionized ammonia criteria (mg un-ionized NH <sub>3</sub> per liter) from EPA 440/5-88-004	
Acute:	0.233
Chronic:	0.035
6. Total Ammonia Criteria (mg/L as NH <sub>3</sub> )	
Acute:	0.82
Chronic:	0.12
7. Total Ammonia Criteria (mg/L as NH <sub>3</sub> -N)	
Acute:	0.677
Chronic:	0.102

fn: TSDCalc10.cls

## APPENDIX C--TECHNICAL CALCULATIONS (CONT'D)

### REASONABLE POTENTIAL CALCULATION FOR PROTECTION OF AQUATIC LIFE

Parameter	State Water Quality Standard		Max concentration at edge of...		LIMIT REQ'D?	Confidence Level		Max effluent conc. measured (metals as total recoverable)		Coeff Variation		# of samples		Multiplier	Acute Dil'n Factor		Chronic Dil'n Factor
	Metal Criteria Translator as decimal	Metal Criteria Translator as decimal	Ambient Conc (metals as dissolved)	Acute	Chronic	Acute Mixing Zone	Chronic Mixing Zone										
	Acute	Chronic	ug/L	ug/L	ug/L	ug/L	ug/L			Pn	ug/L	CV	s	n			
AMMONIA total -see seperate spreadsheets for SW criteria			61	677	102	85	65	NO	0.95	0.368	720	0.60	0.55	3	3.00	89	681
ARSENIC (dissolved) 7440382 2M	1.00			69.00	36.00	0.20	0.03	NO	0.95	0.368	5.91	0.60	0.55	3	3.00	89	681
COPPER - 744058 6M Hardness dependent	0.83	0.83		4.80	3.10	0.36	0.05	NO	0.95	0.368	12.80	0.60	0.55	3	3.00	89	681
LEAD - 7439921 7M Dependent on hardness	0.95	0.95		210.00	8.10	0.02	0.00	NO	0.95	0.368	0.49	0.60	0.55	3	3.00	89	681
NICKEL - 7440020 9M - Dependent on hardness	0.99	0.99		74.00	8.20	0.09	0.01	NO	0.95	0.368	2.70	0.60	0.55	3	3.00	89	681
SILVER - 7740224 11M dependent on hardness.	0.85			1.90	NA	0.04	0.01	NO	0.95	0.368	1.46	0.60	0.55	3	3.00	89	681
ZINC- 7440666 13M hardness dependent	0.95	0.95		90.00	81.00	2.91	0.38	NO	0.95	0.368	91.40	0.60	0.55	3	3.00	89	681

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in *Technical Support Document for Water Quality-based Toxics Control*, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56.

### REASONABLE POTENTIAL CALCULATION FOR PROTECTION OF HUMAN HEALTH

Parameter	Ambient Concentration (Geometric Mean)		Water Quality Criteria for Protection of Human Health		LIMIT REQ'D?	Estimated Percentile at 95% Confidence		Pn	Max effluent conc. measured		Coeff Variation	S	# of samples from which # in col. K was taken		Multiplier	Calculated 50th percentile Effluent Conc. (When n>10)		Dilution Factor
	ug/L	ug/L	ug/L	ug/L		ug/L	ug/L		ug/L	ug/L			n	n		ug/L	ug/L	
	ug/L	ug/L	ug/L	ug/L		ug/L	ug/L		ug/L	ug/L			n	n		ug/L	ug/L	
NICKEL - 7440020 9M - Dependent on hardness	0.0	4600	3.25		NO	0.50	0.37	2.70	0.60	0.6	3	1.20						1
BIS(2-ETHYLHEXYL) PHTHALATE 117817 13B	0.0	5.90	1.82		NO	0.50	0.37	1.51	0.60	0.6	3	1.20						1

## APPENDIX C--TECHNICAL CALCULATIONS (CONT'D)

### WATER QUALITY BASED PERMIT LIMIT CALCULATIONS

<div> Dilution (Dil'n) factor is the inverse of the percent effluent concentration at the edge of the acute or chronic mixing zone. </div>										Waste Load Allocation (WLA) and Long Term Average (LTA) Calculations							Statistical variables for permit limit calculation			
Permit Limit Calculation Summary																				
PARAMETER	Acute Dil'n Factor	Chronic Dil'n Factor	Metal Criteria Translator	Metal Criteria Translator	Ambient Conc. ug/L	Water Quality Standard Acute ug/L	Water Quality Standard Chronic ug/L	Average Monthly Limit (AML) mg/L	Maximum Daily Limit (MDL) mg/L	WLA Acute ug/L	WLA Chronic ug/L	LTA Acute ug/L	LTA Chronic ug/L	LTA Coeff. Var. (CV) decimal	LTA Prob'y Basis decimal	Limiting LTA ug/L	Coeff. Var. (CV) decimal	AML Prob'y Basis decimal	MDL Prob'y Basis decimal	# of Samples per Month n
Chlorine	89	681				13.00	7.50	0.44	1.16*	1157	5108	371.5	2694	0.60	0.99	371.5	0.60	0.95	0.99	30

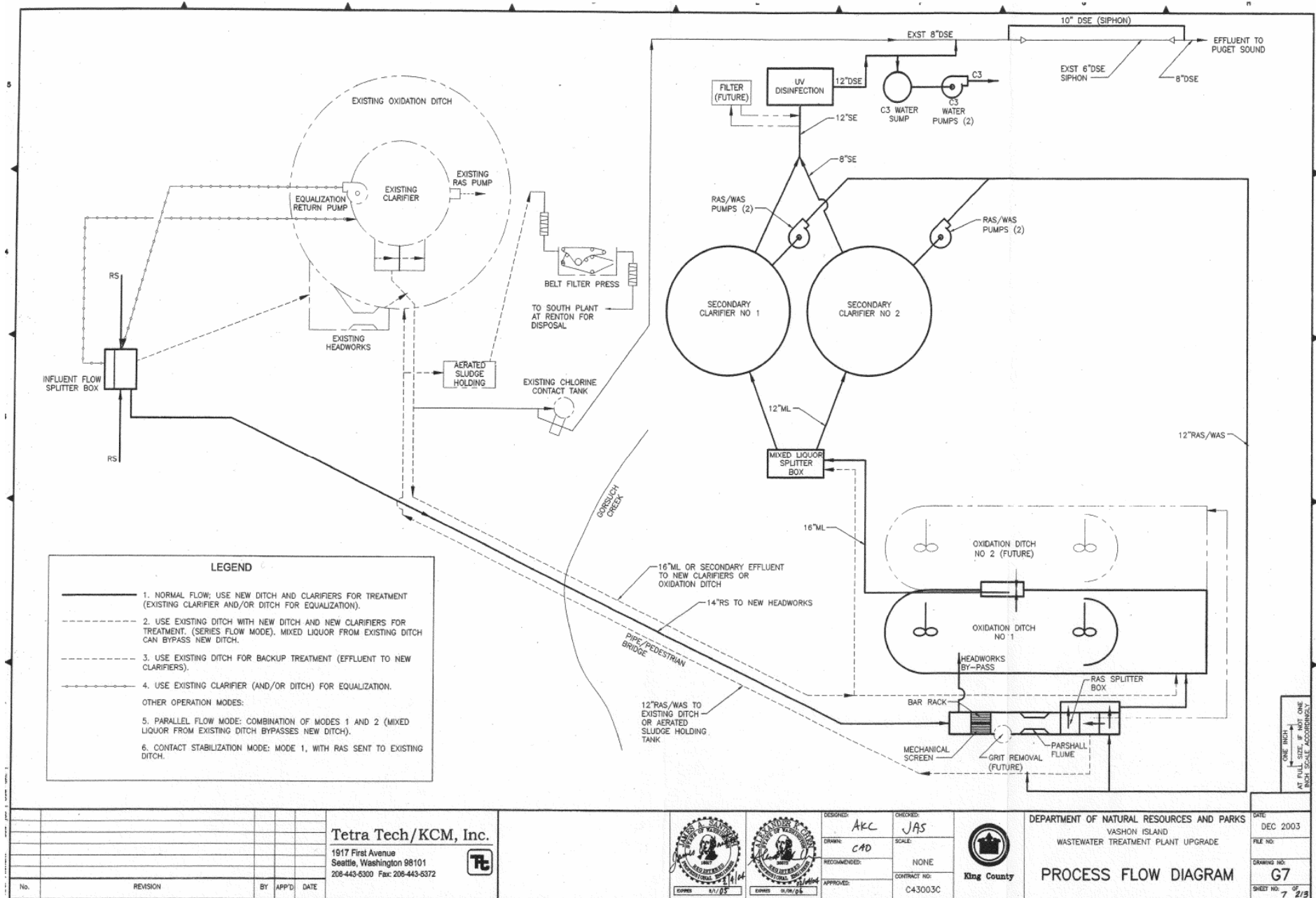
\* Technology-based Limits for Chlorine are 0.5 and 0.75 mg/L for Average Monthly and Max Daily, respectively. Therefore, the permit will include limits of 0.44 and 0.75 mg/L for Average Monthly and Max Daily, respectively.

This spreadsheet calculates water quality based permit limits based on the two value steady state model using the State Water Quality standards contained in WAC 173-201A. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 99. Last revision date 9/98.

## **APPENDIX D--RESPONSE TO COMMENTS**

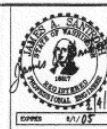
No comments were received during the public comment period.

# APPENDIX E—FLOW DIAGRAM OF TREATMENT FACILITY



Tetra Tech/KCM, Inc.

1917 First Avenue  
Seattle, Washington 98101  
206-443-0300 Fax: 206-443-0372



DESIGNED: AKC  
DRAWN: CAD  
RECOMMENDED:  
APPROVED:

CHECKED: JAS  
SCALE:  
NONE  
CONTRACT NO: C43003C



DEPARTMENT OF NATURAL RESOURCES AND PARKS  
VASHON ISLAND  
WASTEWATER TREATMENT PLANT UPGRADE

PROCESS FLOW DIAGRAM

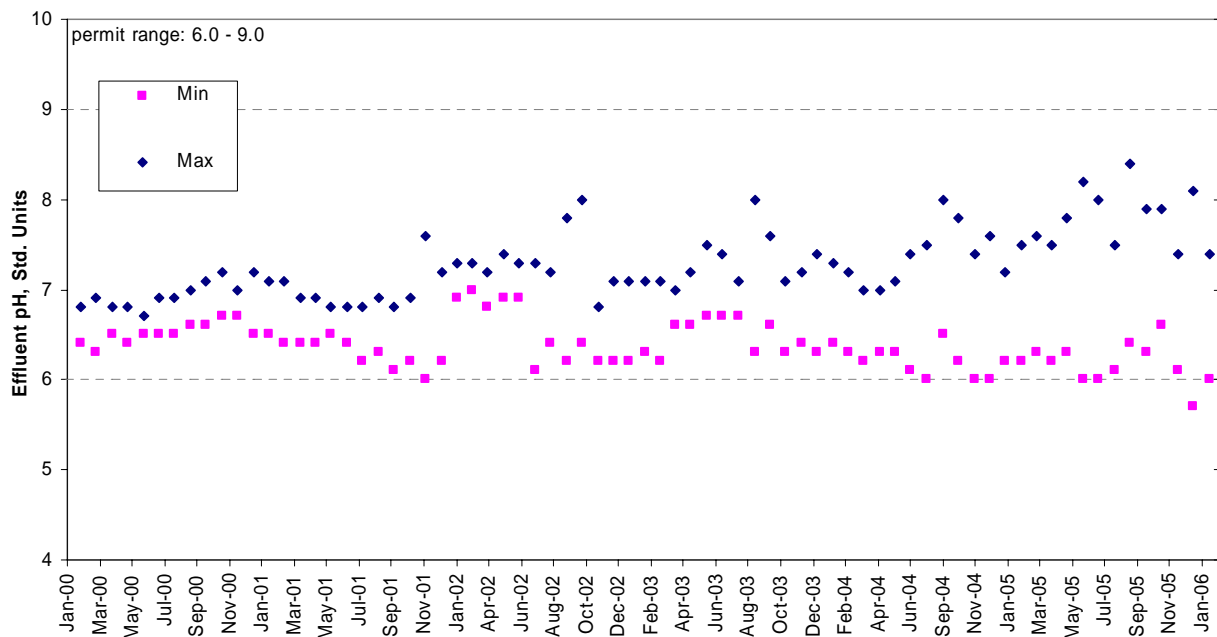
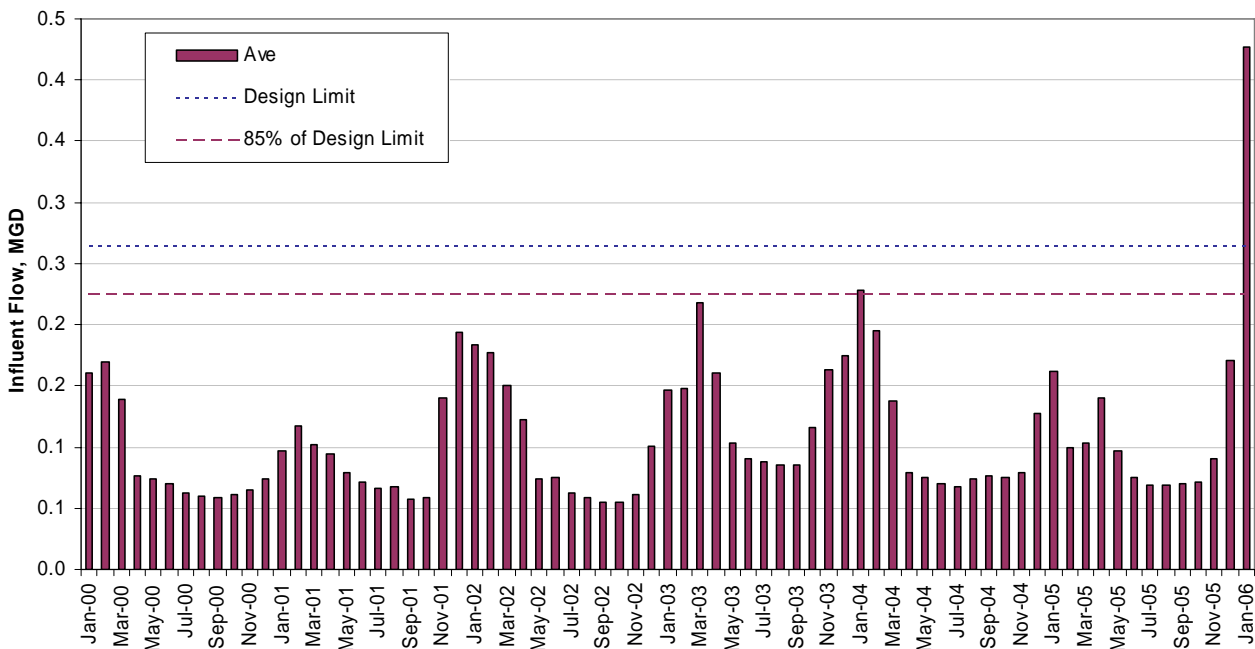
DATE: DEC 2003  
FILE NO:  
DRAWING NO: G7  
SHEET NO: 7 OF 13



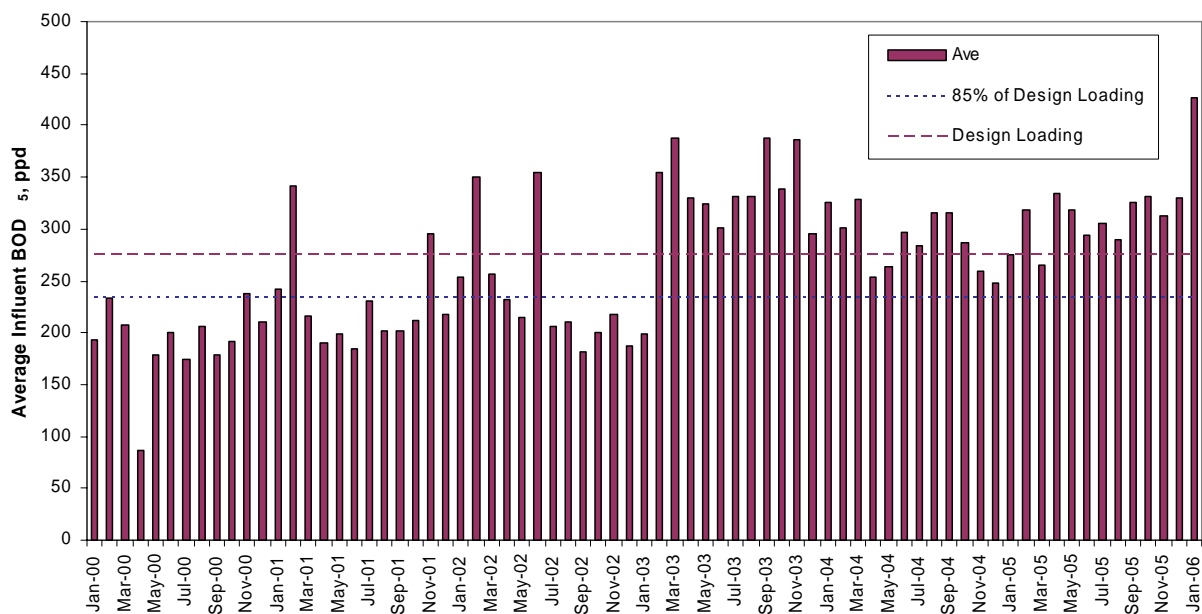
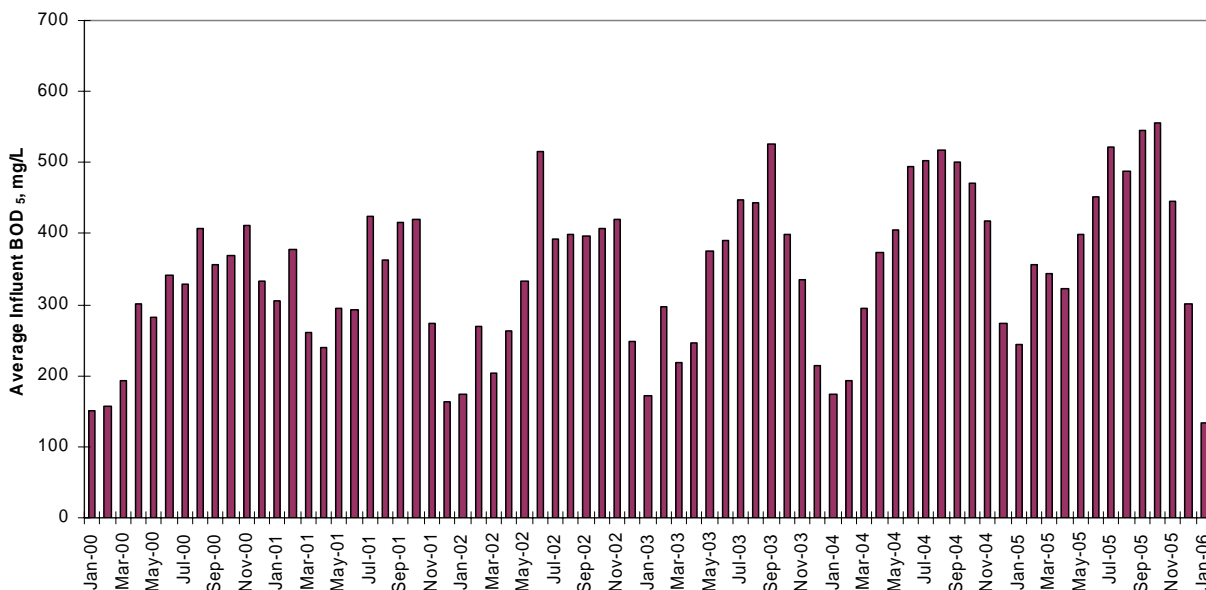
## APPENDIX F—DISCHARGE MONITORING DATA, 1998 – 2005

Date	Influent												Effluent																			
	Flow, MGD				BOD, mg/L				TSS, mg/L				BOD, mg/L				TSS, mg/L				BOD, % Removal				TSS, % Removal				pH		Fecal Coliform, #/100 ml	
	Flow, MGD		BOD, mg/L		BOD, ppd		TSS, mg/L		TSS, ppd		BOD, mg/L		BOD, ppd		TSS, mg/L		TSS, ppd		% Removal		% Removal		pH		Fecal Coliform, #/100 ml							
	Ave	Max	Ave	Max	Ave	Max	Ave	Max	Ave	Max	Ave	Max	Ave	Max	Ave	Max	Ave	Max	Ave	Max	Ave	Max	Min	Max	GEM	GM7						
1-Jan-00	0.160	0.290	150	188	193	288	96	136	132	270	8.1	12	11.3	19	94.6	6.8	10	9.6	15	93	6.4	6.8	11	22								
1-Feb-00	0.170	0.480	156	217	233	363	120	302	183	330	10	12	15	20	93.4	5.5	7	9	12	95.5	6.4	6.8	7	16								
1-Mar-00	0.139	0.300	192	258	207	360	132	288	138	199	8.7	12	9.8	24	95.5	5.1	12	6.1	24	96.2	6.3	6.9	25	54								
1-Apr-00	0.076	0.100	302	440	87	301	267	592	110	406	13	21	8	13	96	13	18	8	10	95	6.5	6.8	15	37								
1-May-00	0.074	0.110	282	419	178	252	220	375	135	216	28	41	19	32	90	29	48	19	37	87	6.4	6.8	16	27								
1-Jun-00	0.070	0.120	342	447	200	283	250	388	149	220	7	9	4	5	98	6	7	4	5	98	6.5	6.7	44	67								
1-Jul-00	0.062	0.075	329	390	175	218	257	308	136	168	7	9	4	5	98	4	7	2	4	98	6.5	6.9	41	89								
1-Aug-00	0.060	0.070	407	554	206	284	332	438	169	219	7	10	4	5	98	9	12	5	6	97	6.5	6.9	77	127								
1-Sep-00	0.059	0.067	357	424	178	210	270	345	137	170	7	11	4	6	98	10	12	5.5	6	96	6.6	7.0	82	154								
1-Oct-00	0.061	0.084	370	458	192	225	247	312	132	190	13	20	6	9	97	27	46	14	23	89	6.6	7.1	79	166								
1-Nov-00	0.065	0.107	412	564	238	317	288	391	168	243	9	13	5	9	98	12	35	7	18	96	6.7	7.2	13	68								
1-Dec-00	0.074	0.113	334	442	210	280	233	312	147	198	5	6	4	5	98	5	8	4	6	98	6.7	7.0	7	14								
1-Jan-01	0.097	0.169	305	427	242	328	242	628	195	545	6	7	5	8	98	5	6	4	5	98	6.5	7.2	7	7								
1-Feb-01	0.117	0.168	378	565	342	485	250	524	238	398	5	48	4	48	99	3	40	2	33	99	6.5	7.1	4	7								
1-Mar-01	0.102	0.180	260	397	216	278	208	314	181	359	20	9	19	8	92	18	13	18	14	91	6.4	7.1	13	44								
1-Apr-01	0.094	0.140	239	323	190	261	200	264	163	248	5.9	8.6	4.6	5.6	97.5	5.1	5.7	4.1	4.4	97.4	6.4	6.9	10	15								
1-May-01	0.079	0.110	294	338	199	226	214	320	146	214	12	20	8	13	96	10	15	7	10	96	6.4	6.9	24	76								
1-Jun-01	0.072	0.120	292	352	184	229	222	290	141	180	15	22	9	14	95	10	13	6	8	95	6.5	6.8	99	381								
1-Jul-01	0.066	0.078	424	652	230	370	286	368	157	206	12	18	7	10	97	10	14	6	8	96	6.4	6.8	149	314								
1-Aug-01	0.067	0.129	362	435	202	229	249	352	138	197	14	21	8	11	96	15	17	8	9	94	6.2	6.8	162	391								
1-Sep-01	0.058	0.069	415	684	202	308	296	555	144	250	10	14	5	7	98	13	18	6	9	96	6.3	6.9	151	394								
1-Oct-01	0.059	0.081	419	519	212	289	255	362	128	166	43	153	21	74	90	61	142	30	70	76	6.1	6.8	50	277								
1-Nov-01	0.140	0.350	273	950	295	515	161	406	194	555	133	439	287	908	51	87	138	201	359	46	6.2	6.9	251	1115								
1-Dec-01	0.194	0.563	163	256	218	256	104	160	151	217	10	12	14	23	94	9	13	14	28	91	6.0	7.6	29	53								
1-Jan-02	0.184	0.540	174	206	254	755	106	220	159	414	23	45	41	120	87	27	40	79	171	74	6.2	7.2	67	167								
1-Feb-02	0.177	0.325	270	471	350	499	146	164	215	323	14	16	20	27	95	12	17	16	17	92	6.9	7.3	158	419								
1-Mar-02	0.150	0.264	204	271	256	312	264	170	244		10	18	12	18	95	14	38	18	37	90	7.0	7.3	54	168								
1-Apr-02	0.122	0.268	263	380	232	301	167	282	161	253	21	30	18	26	92	46	70	48	74	72	6.8	7.2	11	128								
1-May-02	0.074	0.088	333	384	215	247	193	246	122	166	26	37	17	27	92	41	65	27	49	79	6.9	7.4	116	266								
1-Jun-02	0.075	0.243	515	1112	355	705	244	327	166	335	16	19	11	12	97	23	29	16	20	90	6.9	7.3	111	198								
1-Jul-02	0.063	0.086	393	503	206	269	296	370	154	216	9	12	5	6	98	21	42	11	19	93	6.1	7.3	31	192								
1-Aug-02	0.059	0.100	398	516	211	275	286	488	150	260	7	11	4	5	98	16	32	9	13	94	6.4	7.2	75	168								
1-Sep-02	0.055	0.074	397	479	182	236	315	374	146	184	15	23	7	11	85	40	66	19	31	87	6.2	7.8	91	352								
1-Oct-02	0.055	0.075	408	572	201	272	296	409	146	215	11	13	5	7	97	22	30	11	16	93	6.4	8.0	36	93								
1-Nov-02	0.061	0.080	419	768	217	410	277	406	149	254	9	10	5	6	98	20	31	11	18	93	6.2	6.8	49	202								
1-Dec-02	0.101	0.256	248	398	188	388	368	776	295	777	9	17	7	14	96	26	31	20	29	93	6.2	7.1	145	303								
1-Jan-03	0.147	0.300	171	293	199	293	126	198	139	203	17	25	20	24	90	42	51	47	62	67	6.2	7.1	94	146								
1-Feb-03	0.148	0.237	298	518	354	687	228	722	270	957	22	29	66	99	93	41	75	46	79	82	6.3	7.1	76	360								
1-Mar-03	0.218	0.557	219	393	387	674	215	416	377	909	9	10	18	36	96	14	16	26	47	94	6.2	7.1	38	108								
1-Apr-03	0.161	0.250	246	328	330	462	169	268	227	382	7	10	10	16	97	8	14	11	21	95	6.6	7	35	71								
1-May-03	0.103	0.140	375	402	324	396	278	425	254	457	10	13	9	11	97	17	24	15	21	94	6.6	7.2	62	189								
1-Jun-03	0.090	0.099	390	438	301	338	233	345	180	262	11	14	8	11	97	21	31	16	24	91	6.7	7.5	181	329								
1-Jul-03	0.088	0.099	447	498	331	386	288	490	212	376	8	11	6	8	98	26	28	19	21	91	6.7	7.4	71	212								
1-Aug-03	0.086	0.103	443	490	332	381	295	476	218	329	6	6	4	5	99	19	22	14	16	94	6.7	7.1	81	94								
1-Sep-03	0.086	0.095	526	602	388	433	355	503	264	386	14	20	10	14	97	29	34	21	25	92	6.3	8	143	336								
1-Oct-03	0.116	0.430	399	538	338	440	281	549	253	435	10	15	66	99	97	17	24	16	24	94	6.6	7.6	41	182								
1-Nov-03	0.163	0.528	335	417	386	659	245	364	305	757	7	11	9	16	98	15	24	21	40	94	6.3	7.1	79	113								
1-Dec-03	0.175	0.253	215	297	295	405	134	219	187	301	6	6	8	9	97	9	10	12	15	94	6.4	7.2	30	136								
1-Jan-04	0.228	0.451	174	306	325	413	127	188	238	379	8	21	20	64	96	10	18	24	54	92	6.3	7.4	9	34								
1-Feb-04	0.195	0.274	193	258	301	372	135	216	205	283	5	6	8	11	98	7	11	12	22	95	6.4	7.3	3	8								
1-Mar-04	0.138	0.185	295	369	328	412	208	282	235	309	5	7																				

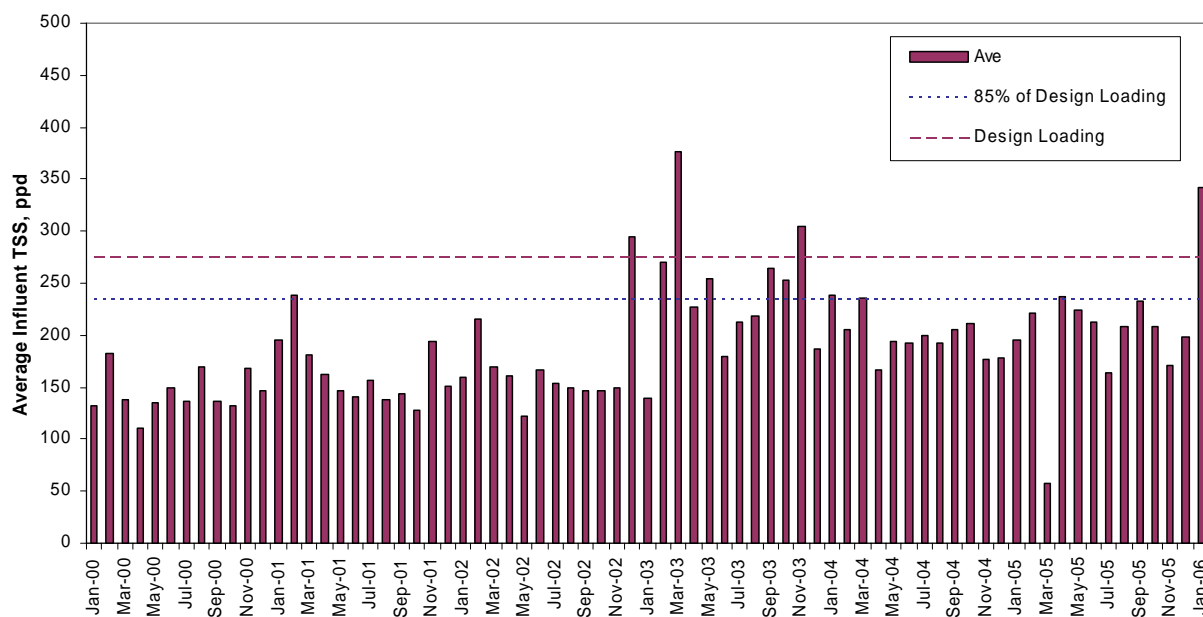
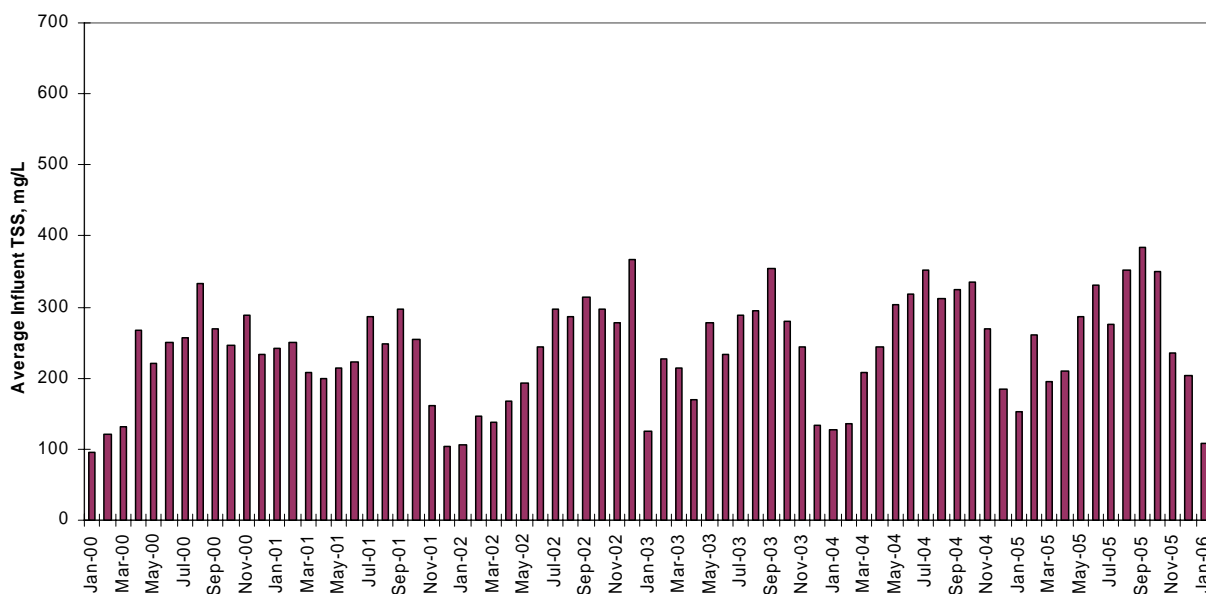
## APPENDIX F—DISCHARGE MONITORING DATA (CONT'D)



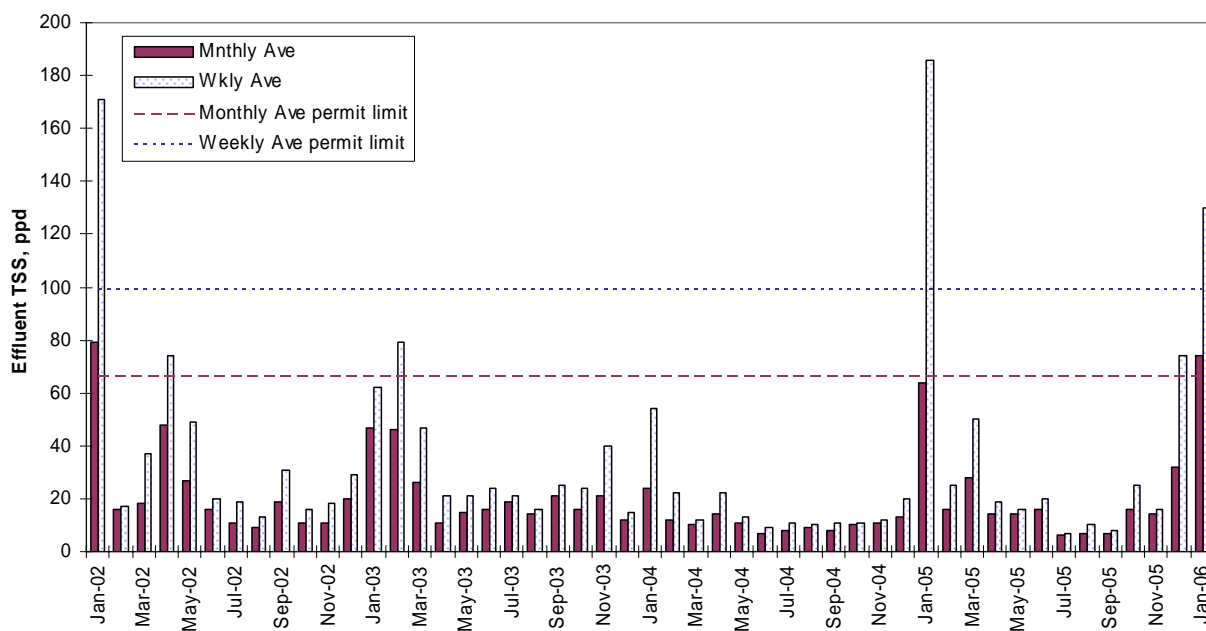
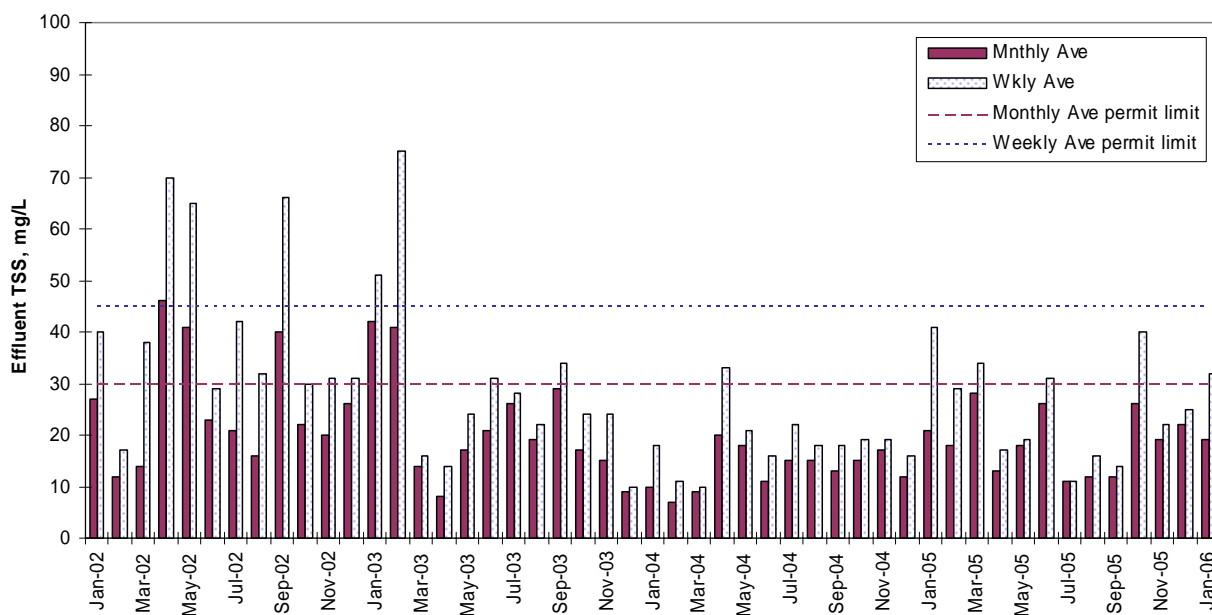
**APPENDIX F—DISCHARGE MONITORING DATA (CONT'D)**



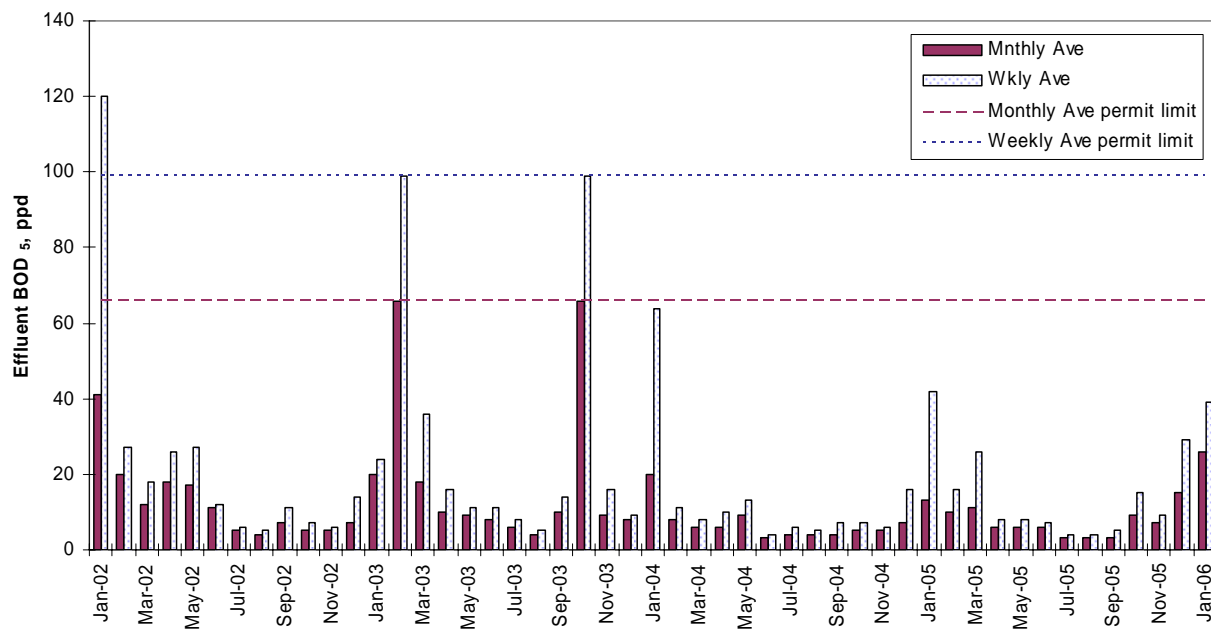
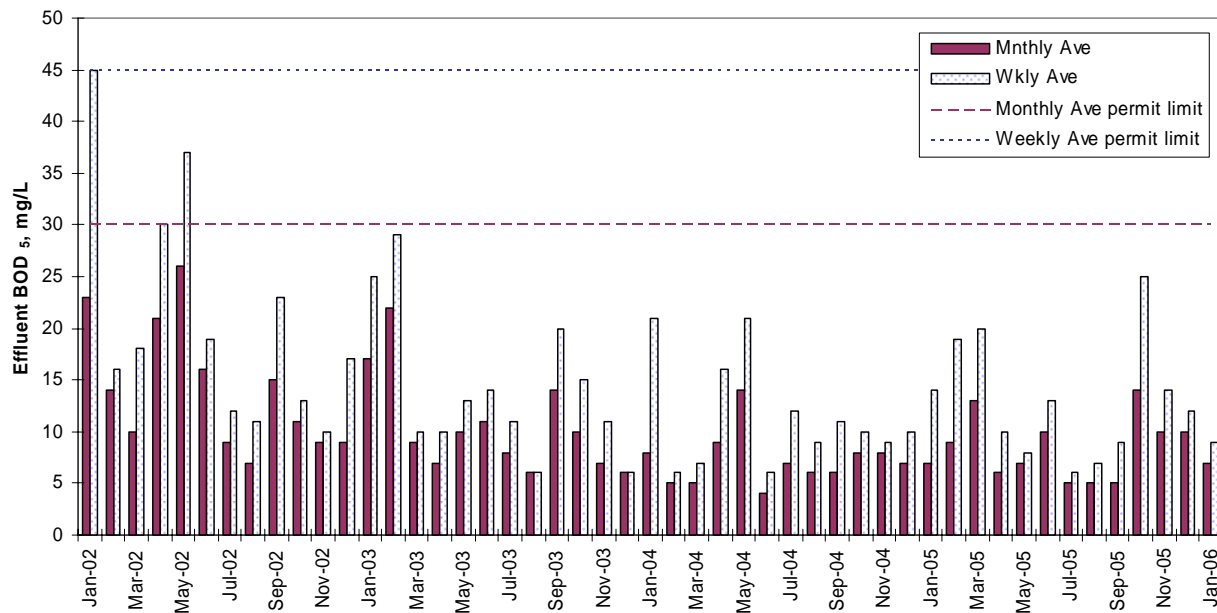
## APPENDIX F—DISCHARGE MONITORING DATA (CONT'D)



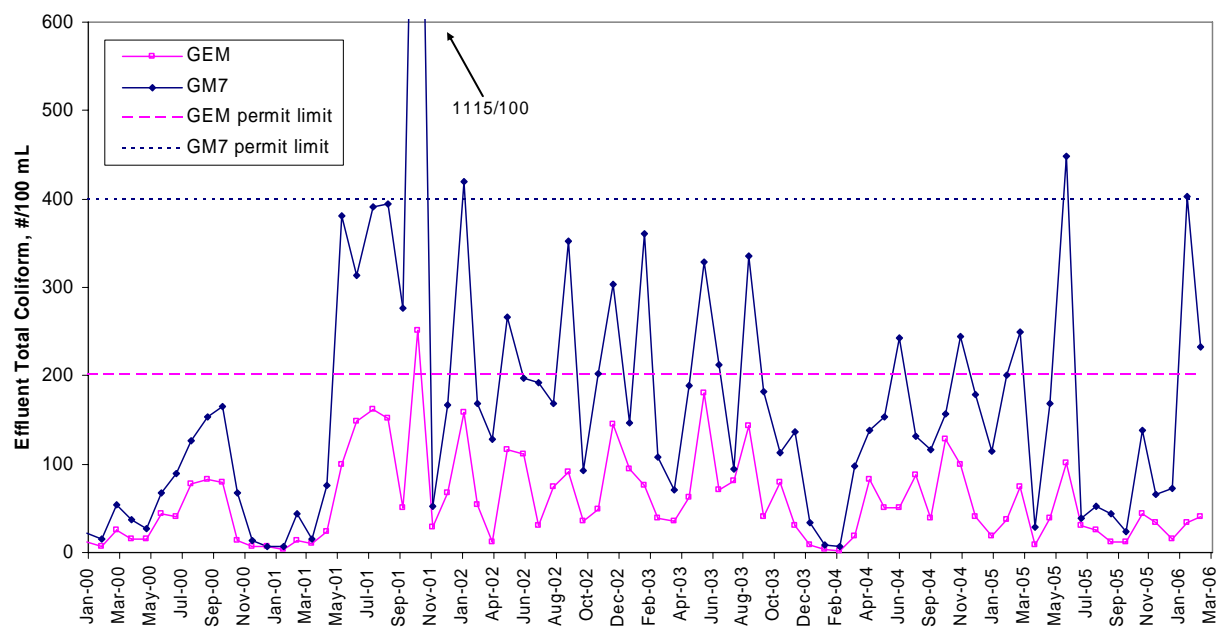
## APPENDIX F—DISCHARGE MONITORING DATA (cont'd)



## APPENDIX F—DISCHARGE MONITORING DATA (cont'd)



**APPENDIX F—DISCHARGE MONITORING DATA (cont'd)**



# APPENDIX G—DILUTION MODEL RESULTS

(Taken from the 2003 facilities plan)

200' depth - single port  
Acute

Case 48; ambient file C:\plumes\Vashon.001.db; Diffuser table record 12: -----

P-dia (m)	P-elev (m)	V-angle (deg)	H-angle (deg)	Ports (#)	SttTime (hr)	EndTime (hr)	Incrmnt (hr)
0.2032	0.3048	0.0	90.0	1.0	1.0	48.0	1.0

AcuteM2 (m)	ChrcM2 (m)	P-depth (m)	Ttl-flo (m3/s)	Eff-sal (psu)	Temp (C)	Polutnt (kg/kg)
12.192	121.92	60.961	0.06002	0.0	10.0	100.0

Froude number: 8.769

Step	W Column (m)	Amb-cur (m/s)	Amb-sal (psu)	Amb-tem (C)	P-dia (m)	Polutnt (kg/kg)	Dilutn (#)	x-posn (m)	y-posn (m)
0	60.96	0.227	29.02	11.25	0.203	100.0	1.0	0.0	0.0
100	60.59	0.227	29.02	11.26	1.073	13.8	7.108	0.0	2.775
200	58.13	0.227	29.03	11.3	3.759	1.905	51.36	0.0	9.115
228	56.98	0.227	29.03	11.32	5.125	1.094	89.4	0.0	12.23; acute zone, ←
300	52.28	0.227	29.03	11.4	10.92	0.263	371.9	0.0	28.41; trap level, 100
370	43.54	0.227	29.04	11.56	22.24	0.0658	1487.6	0.0	77.85; trap level, 100
391	39.87	0.227	29.04	11.62	27.49	0.0434	2254.7	0.0	122.8; chronic
396	39.43	0.227	29.04	11.64	28.68	0.0399	2450.1	0.0	149.5; local

maximum rise or fall,  
Outside chronic zone

200' depth - single port  
Chronic

Case 13; ambient file C:\plumes\Vashon.001.db; Diffuser table record 11: -----

P-dia (m)	P-elev (m)	V-angle (deg)	H-angle (deg)	Ports (#)	SttTime (hr)	EndTime (hr)	Incrmnt (hr)
0.2032	0.3048	0.0	90.0	1.0	17.0	32.0	1.0

AcuteM2 (m)	ChrcM2 (m)	P-depth (m)	Ttl-flo (m3/s)	Eff-sal (psu)	Temp (C)	Polutnt (kg/kg)
12.192	121.92	60.961	0.03067	0.0	10.0	100.0

Froude number: 4.411

Step	W Column (m)	Amb-cur (m/s)	Amb-sal (psu)	Amb-tem (C)	P-dia (m)	Polutnt (kg/kg)	Dilutn (#)	x-posn (m)	y-posn (m)
0	60.96	0.084	29.36	8.348	0.203	100.0	1.0	0.0	0.0
100	60.04	0.084	29.35	8.416	0.942	14.78	6.634	0.0	2.096
200	55.42	0.084	29.32	8.761	3.248	2.04	47.93	0.0	5.52
282	48.05	0.084	29.28	9.312	9.182	0.402	243.0	0.0	12.2; acute zone,
295	46.69	0.084	29.27	9.415	10.88	0.311	314.4	0.0	14.11; trap level,
300	46.18	0.084	29.26	9.454	11.62	0.282	347.1	0.0	14.96;
353	43.66	0.084	29.25	9.651	16.48	0.164	594.4	0.0	24.58; local

maximum rise or fall,  
Const Eddy Diffusivity. Farfield dispersion based on wastefield width of 16.48 m

conc (kg/kg)	dilutn	width (m)	distance (m)	time (hrs)	(kg/kg)	(s-1)	(m/s)	(m0.67/s2)
0.16439	594.7	17.74	36.58	0.0397	0.0	0.0	0.084	3.00E-4
0.16412	595.7	18.94	48.77	0.08	0.0	0.0	0.084	3.00E-4
0.16245	602.0	20.06	60.96	0.12	0.0	0.0	0.084	3.00E-4
0.15954	613.2	21.13	73.15	0.161	0.0	0.0	0.084	3.00E-4
0.15587	628.0	22.14	85.34	0.201	0.0	0.0	0.084	3.00E-4
0.15192	644.7	23.11	97.54	0.241	0.0	0.0	0.084	3.00E-4
0.14792	662.5	24.04	109.7	0.282	0.0	0.0	0.084	3.00E-4
0.144	680.9	24.93	121.9	0.322	0.0	0.0	0.084	3.00E-4

count: 8



## APPENDIX H —EPA LIST OF 126 PRIORITY POLLUTANTS

### EPA List of 126 Priority Pollutants

(source: 40 CFR Pt. 423, titled "Appendix A to Part 403 - 126 Priority Pollutants")

#### Chlorinated Benzenes

Chlorobenzene  
1,2-dichlorobenzene  
1,3-dichlorobenzene  
1,4-dichlorobenzene  
1,2,4-trichlorobenzene  
Hexachlorobenzene

#### Chlorinated Ethanes

Chloroethane  
1,1-dichloroethane  
1,2-dichloroethane  
1,1,2-trichloroethane  
1,1,1-trichloroethane  
1,1,2,2-tetrachloroethane  
Hexachloroethane

#### Chlorinated Phenols

2-chlorophenol  
2,4-dichlorophenol  
2,4,6-trichlorophenol  
Parametachlorocresol (4-chloro-3-methyl phenol)

#### Other Chlorinated Organics

Chloroform (trichloromethane)  
Carbon tetrachloride (tetrachloromethane)  
Bis(2-chloroethoxy)methane  
Bis(2-chloroethyl)ether  
2-chloroethyl vinyl ether (mixed)  
2-chloronaphthalene  
3,3'-dichlorobenzidine  
1,1-dichloroethylene  
1,2-trans-dichloroethylene  
1,2-dichloropropane  
1,2-dichloropropylene (1,3-dichloropropene)  
Tetrachloroethylene  
Trichloroethylene  
Vinyl chloride (chloroethylene)  
Hexachlorobutadiene  
Hexachlorocyclopentadiene  
2,3,7,8-tetrachloro-dibenzo-p-dioxin (TCDD)

#### Haloethers

4-chlorophenyl phenyl ether  
2-bromophenyl phenyl ether  
Bis(2-chloroisopropyl)

#### Halomethanes

Methylene chloride (dichloromethane)  
Methyl chloride (chloromethane)  
Methyl bromide (bromomethane)  
Bromoform (tribromomethane)  
Dichlorobromomethane  
Chlorodibromomethane

#### Nitroamines

N-nitrosodimethylamine  
N-nitrosodiphenylamine  
N-nitrosodi-n-propylamine

#### Phenols (other than chlorinated)

2-nitrophenol  
4-nitrophenol  
2,4-dinitrophenol  
4,6-dinitro-o-cresol (4,6-dinitro-2-methylphenol)  
Pentachlorophenol  
Phenol  
2,4-dimethylphenol  
1, 2-diphenyl hydrazine (azobenzene)  
Total Phenolic Compounds

#### Phthalate Esters

Bis(2-ethylhexyl)phthalate  
Butyl benzyl phthalate  
Di-n-butyl phthalate  
Di-n-octyl phthalate  
Diethyl phthalate  
Dimethyl phthalate

#### Polynuclear Aromatic Hydrocarbons (PAHs)

Acenaphthene  
1,2-benzanthracene (benzo(a)anthracene)  
Benzo(a)pyrene (3,4-benzo-pyrene)  
3,4-benzofluoranthene (benzo(b)fluoranthene)  
11,12-benzofluoranthene (benzo(k)fluoranthene)  
Chrysene  
Acenaphthylene  
Anthracene  
1,12-benzoperylene (benzo(ghi)perylene)  
Fluorene  
Fluoranthene  
Phenanthrene  
1,2,5,6-dibenzanthracene  
(dibenzo(a,h)anthracene)  
Indeno (1,2,3-cd) pyrene (2,3-o-phenylene pyrene)  
Pyrene

#### Pesticides and Metabolites

Aldrin  
Dieldrin  
Chlordane (technical mixture and metabolites)  
Alpha-endosulfan  
Beta-endosulfan  
Endosulfan sulfate  
Endrin  
Endrin aldehyde  
Heptachlor  
Heptachlor epoxide (BHChexachlorocyclohexane)  
Alpha-BHC  
Beta-BHC  
Gamma-BHC (Lindane)  
Delta-BHC  
Toxaphene

#### DDT and Metabolites

4,4-DDT  
4,4-DDE (p,p-DDX)  
4,4-DDD (p,p-DDE)

#### Polychlorinated Biphenyls (PCBs)

PCB-1242 (Aroclor 1242)  
PCB-1254 (Aroclor 1254)  
PCB-1221 (Aroclor 1221)  
PCB-1232 (Aroclor 1232)  
PCB-1248 (Aroclor 1248)  
PCB-1260 (Aroclor 1260)  
PCB-1016 (Aroclor 1016)

#### Other Organics

Acrolein  
Acrylonitrile  
Benzene  
Benzidine  
2,4-dinitrotolulene  
2,6-dinitrotolulene  
Ethylbenzene  
Isophrone  
Naphthalene  
Nitrobenzene  
Tolulene

#### Inorganics

Antimony  
Arsenic  
Asbestos  
Beryllium  
Cadmium  
Chromium, total  
Chromium (VI)  
Copper  
Cyanide, total  
Cyanide, weak acid dissociable  
Lead  
Mercury  
Nickel  
Selenium  
Silver  
Thallium  
Zinc